

Elite Electronic Engineering, Inc.
1516 Centre Circle
Downers Grove, Illinois
(630) 495-9770
www.elitetest.com

Engineering Test Report Number 31598-02

**MEASUREMENT OF RF INTERFERENCE FROM A
MODEL NCR RBA US VERSION**

FOR: AVID Technologies
2112 Case Parkway South
Twinsburg Ohio, 44097

Dates Tested: January 20, 2003

Test Specifications: FCC "Code of Federal Regulations" Title 47
Part 15, Subpart C, Section 15.249



ENGINEERING TEST REPORT NO. 31598-02
ADMINISTRATIVE DATA AND SUMMARY OF TESTS

DESCRIPTION OF TEST ITEM: Handheld Key FOB device

MODEL NO: NCR RBA US Version

SERIAL NO: 8

MANUFACTURER: Avid Technologies

APPLICABLE SPECIFICATIONS: FCC "Code of Federal Regulations"
Title 47, Part 15, Subpart C

QUANTITY OF ITEMS TESTED: One (1)

TEST PERFORMED BY: ELITE ELECTRONIC ENGINEERING INCORPORATED
Radio Interference Consultants
Downers Grove, Illinois 60515

DATE RECEIVED: January 20, 2003

DATE TESTED: January 20, 2003

PERSONNEL (OPERATORS, OBSERVERS, AND CO-ORDINATORS):

CUSTOMER: Dale Liff of Avid Technologies was present.

ELITE ELECTRONIC: Richard E. King

ELITE JOB NO.: 31598

ABSTRACT: The model NCR RBA US Version, does meet the radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.205 et seq. for Intentional Radiators, when tested per ANSI C63.4-1992.

The radiated emissions level closest to the limit (worst case) occurred at 2428.3MHz. The emissions level at this frequency was .5dB within the limit. See data page 19 for more details.

Report By:


Richard E. King
EMC Engineer

Approved By:

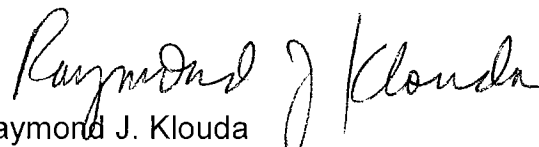

Raymond J. Klouda
Registered Professional
Engineer of Illinois - 44894

TABLE OF CONTENTS

PARAGRAPH	DESCRIPTION OF CONTENTS	PAGE NO.
1.0	INTRODUCTION	4
1.1	DESCRIPTION OF TEST ITEM	4
1.2	PURPOSE	4
1.3	DEVIATIONS, ADDITIONS AND EXCLUSIONS	4
1.4	APPLICABLE DOCUMENTS	4
1.5	SUBCONTRACTOR IDENTIFICATION	4
1.6	LABORATORY CONDITIONS	4
2.0	TEST ITEM SETUP AND OPERATION	5
2.1	POWER INPUT	5
2.2	GROUNDING	5
2.3	PERIPHERAL EQUIPMENT	5
2.4	INTERCONNECT CABLES	5
3.0	TEST EQUIPMENT	5
3.1	TEST EQUIPMENT LIST	5
3.2	CALIBRATION TRACEABILITY	5
3.3	MEASUREMENT UNCERTAINTY	5
4.0	REQUIREMENTS, PROCEDURES AND RESULTS	6
4.1	POWERLINE CONDUCTED EMISSIONS	6
4.1.1	REQUIREMENTS	6
4.2	RADIATED MEASUREMENTS	6
4.2.1	REQUIREMENTS	6
4.2.3	RESULTS	7
4.3	OCCUPIED BANDWIDTH MEASUREMENTS	8
4.3.1	REQUIREMENTS	8
4.3.2	PROCEDURES	8
4.3.3	RESULTS	8
5.0	CONCLUSION	8
6.0	CERTIFICATION	8
7.0	ENDORSEMENT DISCLAIMER	9
	TABLE I - EQUIPMENT LIST	10

**TOTAL NUMBER OF PAGES IN THIS DOCUMENT,
(INCLUDING DATA SHEETS): 21**

**THIS REPORT SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE
WRITTEN APPROVAL OF ELITE ELECTRONIC ENGINEERING INCORPORATED.**

ENGINEERING TEST REPORT NO. 31598-02
MEASUREMENT OF RF INTERFERENCE FROM
A MODEL NCR RBA US VERSION

1.0 INTRODUCTION:

1.1 DESCRIPTION OF TEST ITEM: This document presents the results of a series of radio interference measurements performed on a model NCR RBA US Version key FOB transmitter, serial number 8 (hereinafter referred to as the test item). The test item was designed to transmit in the 2400MHz to 2483.5MHz band using an internal antenna. The tests were performed for Avid Technologies of Twinsburg, Ohio.

1.2 PURPOSE: The test series was performed to determine if the test item meets the conducted and radiated RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections for Intentional Radiators. Testing was performed in accordance with ANSI C63.4-2001.

1.3 DEVIATIONS, ADDITIONS AND EXCLUSIONS: There were no deviations, additions to, or exclusions from the test specification during this test series.

1.4 APPLICABLE DOCUMENTS: The following documents of the exact issue designated form part of this document to the extent specified herein:

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart C, dated 1 October 2001
- ANSI C63.4-2001, "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"

1.5 SUBCONTRACTOR IDENTIFICATION: This series of tests was performed by Elite Electronic Engineering Incorporated of Downers Grove, Illinois. The laboratory is accredited by the National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP Lab Code: 100278-0.

1.6 LABORATORY CONDITIONS: The temperature at the time of the test was 21°C and the relative humidity was 42%.

2.0 TEST ITEM SETUP AND OPERATION:

A block diagram of the test item setup is included as Figure 1.

2.1 POWER INPUT: The test item was powered with 6VDC through two 3VDC batteries.

2.2 GROUNDING: Since the test item was powered with 6VDC through two 3VDC batteries, it was ungrounded during the tests.

2.3 PERIPHERAL EQUIPMENT: There was no peripheral equipment submitted with the test item.

2.4 INTERCONNECT CABLES: There were no interconnect cables submitted with the test item.

2.5 OPERATIONAL MODE: For all tests the test item and all peripheral equipment were placed on a 80cm high non-conductive stand. The test item and all peripheral equipment was energized.

For all tests, the test item was set to transmit continuously. The battery voltage was periodically checked to ensure proper operation at maximum level. The tests were performed with the test item operating at 2428.0MHz.

3.0 TEST EQUIPMENT:

3.1 TEST EQUIPMENT LIST: A list of the test equipment used can be found on Table I. All equipment was calibrated per the instruction manuals supplied by the manufacturer.

The fundamental, harmonics and spurious emissions were measured with a spectrum analyzer. All measurements were taken with the resolution and video bandwidth of the measuring instrument adjusted to 100kHz below 1GHz and 1MHz above 1GHz.

3.2 CALIBRATION TRACEABILITY: Test equipment is maintained and calibrated on a regular basis. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

3.3 MEASUREMENT UNCERTAINTY: All measurements are an estimate of their true value. The measurement uncertainty characterizes, with a specified confidence level, the

spread of values which may be possible for a given measurement system.

The measurement uncertainty budgets were based on guidelines in "ISO Guide to the Expression of Uncertainty in Measurements" and NAMAS NIS81 "The Treatment of Uncertainty in EMC Measurements".

The measurement uncertainty for these tests is presented below:

<u>Conducted Emission Measurements:</u>		
Combined Standard Uncertainty	1.07	-1.07
Expanded Uncertainty (95% confidence)	2.1	-2.1
<u>Radiated Emission Measurements:</u>		
Combined Standard Uncertainty	2.26	-2.18
Expanded Uncertainty (95% confidence)	4.5	-4.4

4.0 REQUIREMENTS, PROCEDURES AND RESULTS:

4.1 POWERLINE CONDUCTED EMISSIONS:

4.1.1 REQUIREMENTS: Since the test item was powered by internal batteries, no conducted emissions tests were performed.

4.2 RADIATED MEASUREMENTS:

4.2.1 REQUIREMENTS: The test item must comply with the requirements of FCC "Code of Federal Regulations Title 47", Part 15, Subpart C, Section 15.205 et seq.

Paragraph 15.249(a) has the following radiated emission limits:

<u>Fundamental Frequency MHz</u>	<u>Field Intensity mV/m @ 3 meters</u>	<u>Field Strength Harmonics and Spurious uV/m @ 3 meters</u>
2400 to 2483.5	50	500

In addition, emissions appearing in the Restricted Bands of Operation listed in paragraph 15.205(a) shall not exceed the general requirements shown in paragraph 15.209.

4.2.2 PROCEDURES: All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. The walls and ceiling of the shielded chamber are lined with ferrite tiles. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4 2001 for site attenuation.

The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

Preliminary radiated emissions measurements were first performed using a peak detector and automatically plotted. The frequencies where significant emission levels were noted were then remeasured.

With the broadband measuring antennas positioned at a 3 meter distance from the test item, the frequency range from 30MHz to 18GHz was investigated using a peak detector function with the antennas set for vertical polarization. The frequency range from 18GHz to 24GHz was measured but not plotted.

Final radiated emissions were performed on all significant broadband and narrowband emissions found in the preliminary sweeps using the following methods:

- 1) Measurements were made using a peak detector and either a tuned dipole or double ridged waveguide antenna.
- 2) To ensure that maximum, or worst case, emission levels were measured, the following steps were taken:
 - (a) The test item was rotated so that all of its sides were exposed to the receiving antenna.
 - (b) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
 - (c) The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.
 - (d) The fundamental through the 10th harmonic of the transmit frequency were measured.

4.2.3 RESULTS: The preliminary plots, with the test item transmitting at

2428.0MHz, are presented on data pages 13 through 18. The plots are presented for a reference only, and are not used to determine compliance.

The final radiated levels, with the test item transmitting at 2428.0MHz, are presented on data page 19. As can be seen from the data, all emissions measured from the test item were within the specification limits. The emissions level closest to the limit (worst case) occurred at 2428.0MHz. The emissions level at this frequency was .5dB within the limit. See data page 19 for details. Photographs of the test configuration which yielded the highest, or worst case, radiated emission levels are shown on Figure 2.

4.3 BANDEDGE COMPLIANCE MEASUREMENT:

4.3.1 REQUIREMENTS: In accordance with paragraph 15.249(c), all emissions radiated outside the specified bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in 15.209, whichever is the lesser attenuation.

4.3.2 PROCEDURES: The test item was placed on an 80cm high non-conductive stand. The unit was set to transmit continuously. With an antenna positioned nearby, occupied bandwidth emissions were displayed on the spectrum analyzer.

4.3.3 RESULTS: The plot of the emissions near the bandedge are presented on data pages 20 and 21. As can be seen from this data page, the transmitter met the occupied bandwidth requirements.

5.0 CONCLUSION:

It was found that the Avid Technologies model NCR RBA US Version, does meet the conducted and radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.205 et seq. for Intentional Radiators, when tested per ANSI C63.4-2001.

6.0 CERTIFICATION:

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the test specification.

ENGINEERING TEST REPORT NO. 31598-02

The data presented in this test report pertains only to the test item at the test date. Any electrical or mechanical modification made to the test item subsequent to the specified test date will serve to invalidate the data and void this certification.

7.0 ENDORSEMENT DISCLAIMER:

This report must not be used to claim product endorsement by NVLAP or any agency of the US Government.

ENGINEERING TEST REPORT NO. 31598-02

TABLE I: TEST EQUIPMENT LIST

ELITE ELECTRONIC ENG. INC.

Page: 1

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Cal Inv	Due Date
Equipment Type: ACCESSORIES, MISCELLANEOUS								
XTR0	ESD SIMULATOR (DCC-ESD)	NOISE LABORATOR	ESS-200AX	D865015	0.2-30KV	02/11/02	12	02/11/03
XZG0	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	3439A02724	---		N/A	
Equipment Type: AMPLIFIERS								
ADB0	BROADBAND POWER AMPLIFIER	AMPLIFIER RESEA	100W1000M1	24561	80-1000MHZ			NOTE 1
APH0	POWER AMPLIFIER	HEWLETT PACKARD	11975A	2304A00322	2-8GHZ			NOTE 1
APK0	PRE-AMPLIFIER	HEWLETT PACKARD	8449B	3008A00662	1-26.5GHZ	02/22/02	12	02/22/03
ATH0	TWT AMPLIFIER-200W (DCC-MA	MICRO. CAVITY L	10631	1001	1-2GHZ			NOTE 1
Equipment Type: ANTENNAS								
NHG0	STANDARD GAIN HORN ANTENNA	NARDA	638	---	18-26.5GHZ			NOTE 1
NHG1	STANDARD GAIN HORN ANTENNA	NARDA	638	---	18-26.5GHZ			NOTE 1
NW10	RIDGED WAVE GUIDE	AEL	H1498	153	2-18GHZ	08/09/02	12	08/09/03
NW11	RIDGED WAVE GUIDE	AEL	H1498	154	2-18GHZ	08/09/02	12	08/09/03
Equipment Type: ATTENUATORS								
TVD0	VARIABLE ATTENUATOR	HEWLETT PACKARD	K382A	1066	18-26.5GHZ	07/29/02	12	07/29/03
Equipment Type: CONTROLLERS								
CDD2	COMPUTER	HEWLETT PACKARD	D4171A#ABA	US61654645	---			N/A
CMA0	MULTI-DEVICE CONTROLLER	EMCO	2090	9701-1213	---			N/A
Equipment Type: PRINTERS AND PLOTTERS								
HRE1	LASER JET 5P	HEWLETT PACKARD	C3150A	USHB061052	---			N/A
Equipment Type: RECEIVERS								
RAC1	SPECTRUM ANALYZER	HEWLETT PACKARD	85660B	3407A08369	100HZ-22GHZ	01/29/03	12	01/29/04
RACB	RF PRESELECTOR	HEWLETT PACKARD	85685A	3506A01491	20HZ-2GHZ	01/29/03	12	01/29/04
RAE1	SPECTRUM ANALYZER (DCC-CEM	HEWLETT PACKARD	85660A	2209A01336	100HZ-22GHZ	02/06/03	12	02/06/04
RAF3	QUASIPeAK ADAPTER	HEWLETT PACKARD	85650A	3303A01775	0.01-1000MHZ	01/29/03	12	01/29/04
RAH0	FREQUENCY MIXER	HEWLETT PACKARD	11970K	2332A00270	18-26GHZ			N/A
REL1	ISOTROPIC FIELD MONITOR	AMPLIFIER RESEA	FM5004	22912	---			N/A
REM1	ISOTROPIC FIELD PROBE	AMPLIFIER RESEA	FP2083	26911	0.08-40GHZ	04/10/02	12	04/10/03
Equipment Type: SIGNAL GENERATORS								
GBR2	SIGNAL GENERATOR	HEWLETT PACKARD	8648D	3847U00488	0.009-4000MHZ	12/16/02	12	12/16/03
GDJ1	SYNTHESIZED GENERATOR	HEWLETT PACKARD	8672A	2132A02171	2-18GHZ	04/09/02	12	04/09/03
GSB0	SWEEP OSCILLATOR	HEWLETT PACKARD	8350B	2309A02104	0.01-40GHZ	06/20/02	12	06/20/03
GSB8	TUNING HEAD	HEWLETT PACKARD	83570A	2412A00512	18-26.5GHZ	06/19/02	12	06/19/03

Cal. Interval: Listed in Months I/O: Initial Only N/A: Not Applicable
 Note 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.



ELITE ELECTRONIC ENGINEERING INC.
ETR 31598-02
Radiated Emissions Test Setup Anechoic Ferrite Chamber

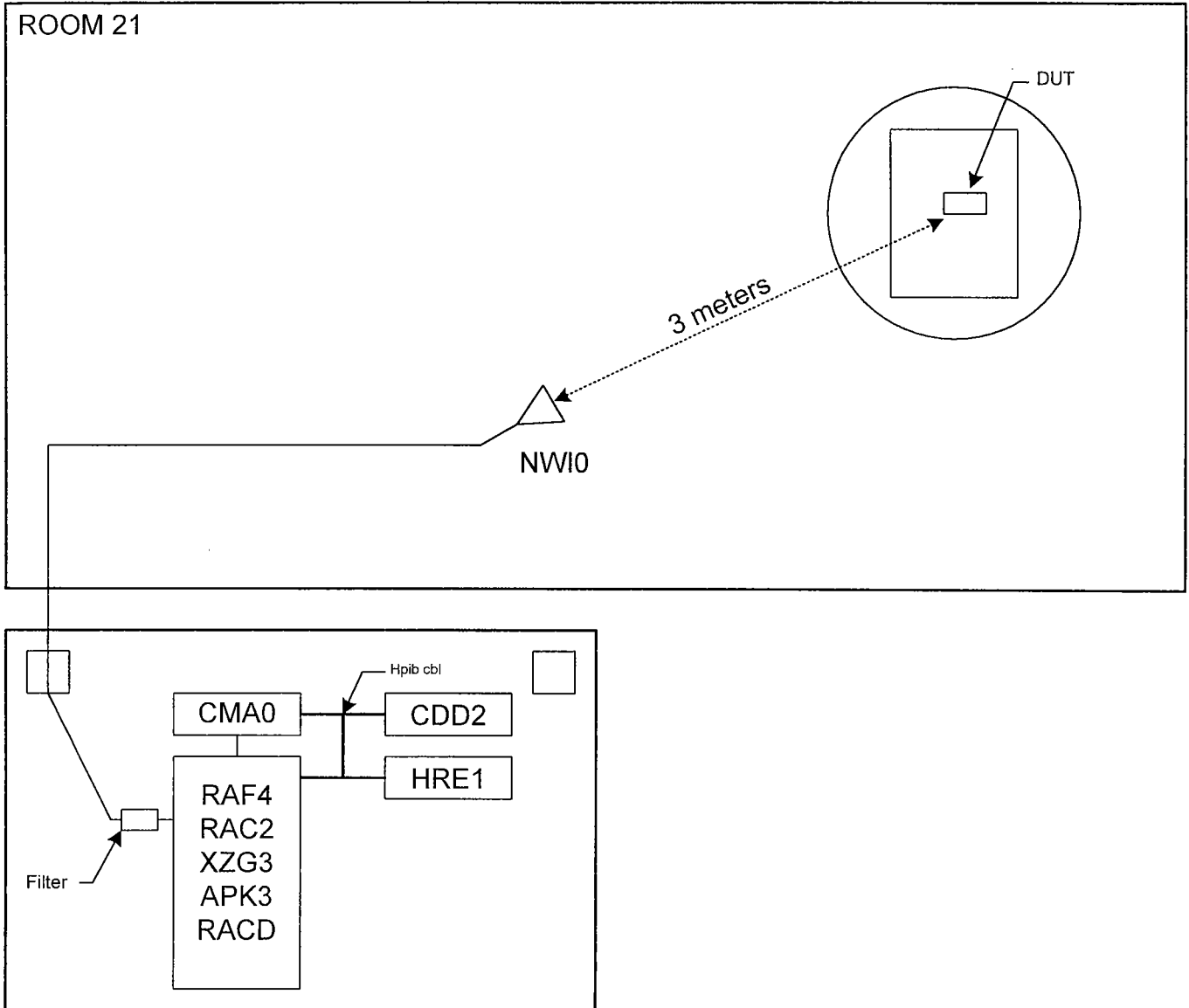
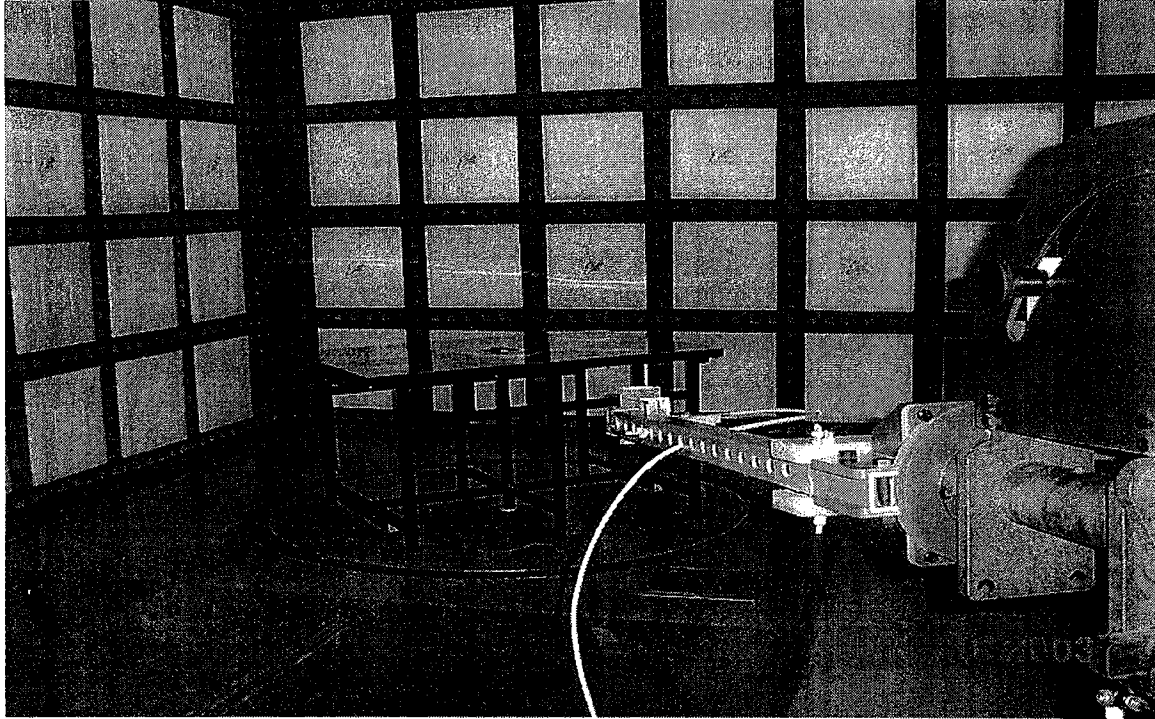
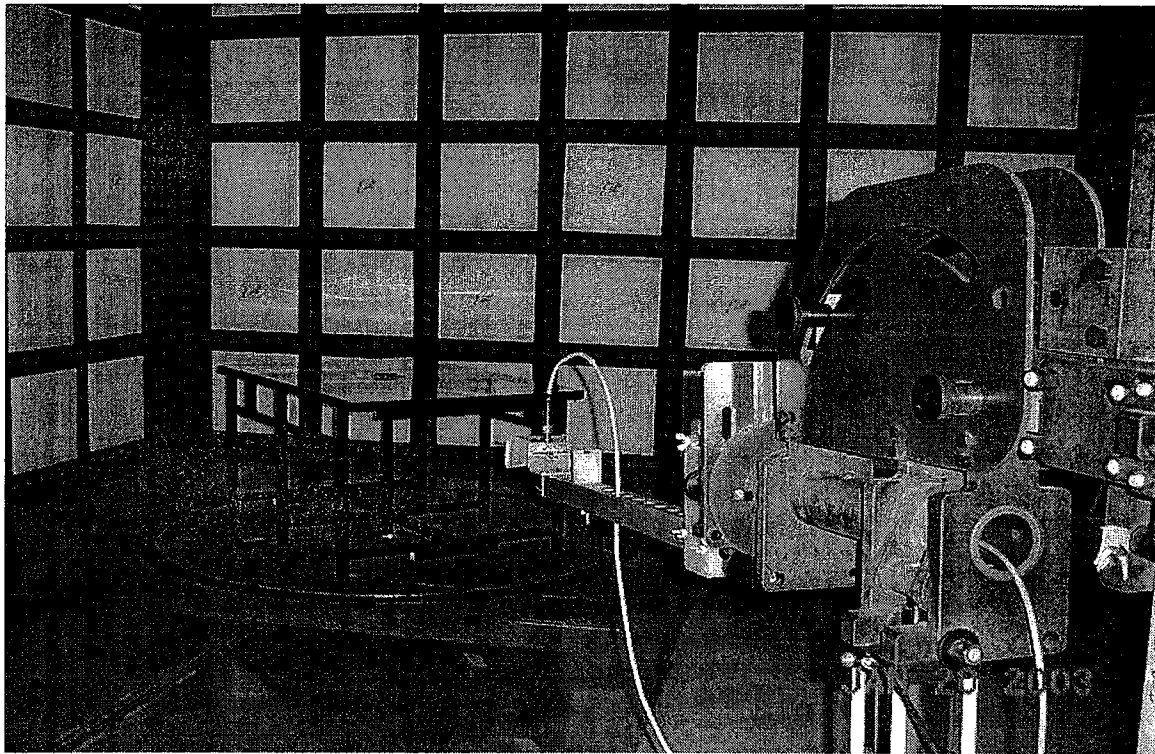


FIGURE 1 BLOCKDIAGRAM OF TEST SETUP

Figure 2



Radiated Emissions Worst Case Horizontal Polarization



Radiated Emissions Worst Case Vertical Polarization

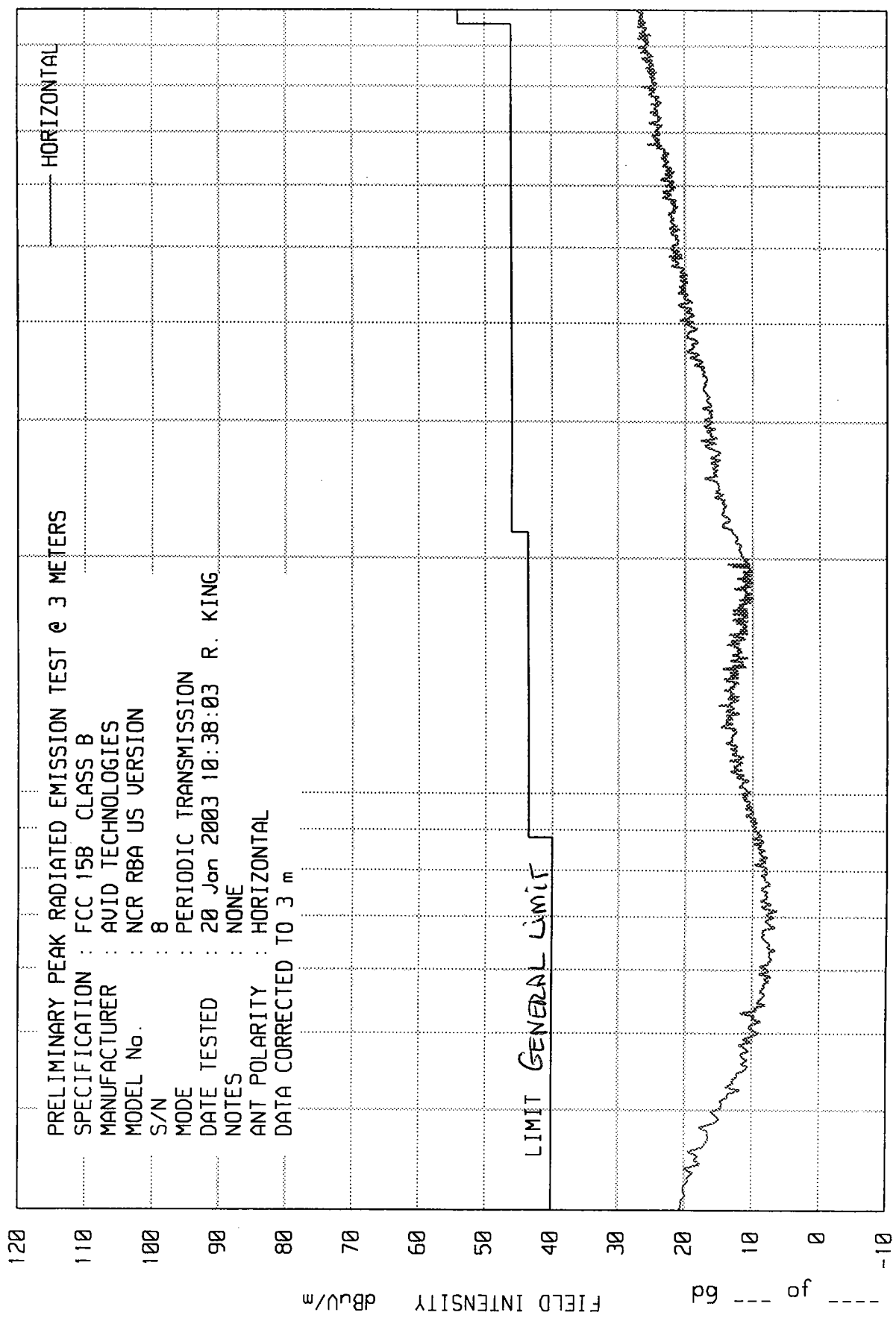
ETR 31598-01

ELITE ELECTRONIC ENGINEERING Inc.

Downers Grove, Ill. 60515

8546A RE RUN 5

10080 10/14/02



START = 30

100

FREQUENCY - MHz

STOP = 1000

ETR 31898-01

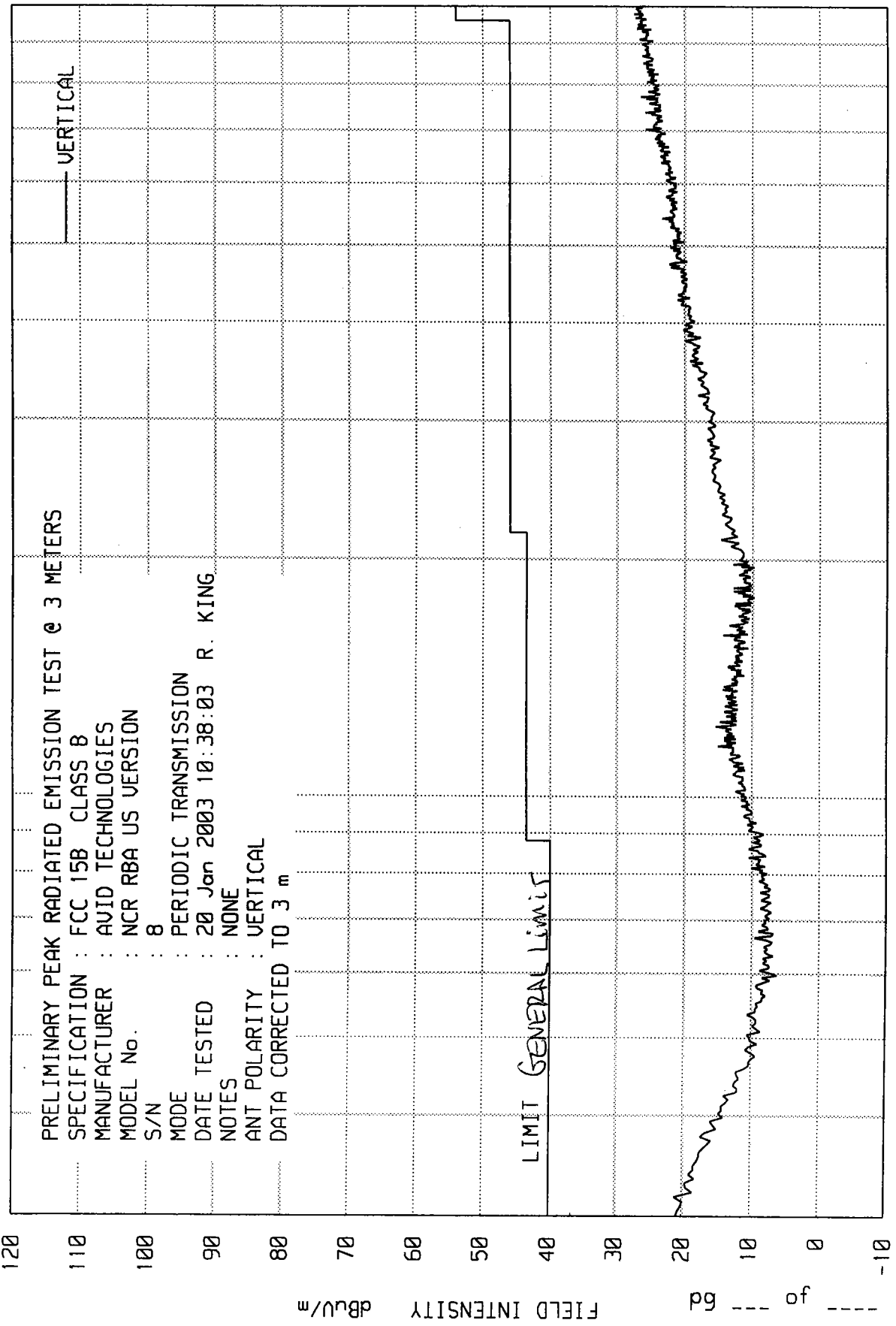
ELITE ELECTRONIC ENGINEERING Inc.

Downers Grove, Ill. 60515

8546A RE RUN 5

10088 10/14/02

PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
 SPECIFICATION : FCC 15B CLASS B
 MANUFACTURER : AUID TECHNOLOGIES
 MODEL No. : NCR RBA US VERSION
 S/N : 8
 MODE : PERIODIC TRANSMISSION
 DATE TESTED : 20 Jan 2003 10:38:03 R. KING
 NOTES : NONE
 ANT POLARITY : VERTICAL
 DATA CORRECTED TO 3 m



STOP = 1000

FREQUENCY - MHz

100

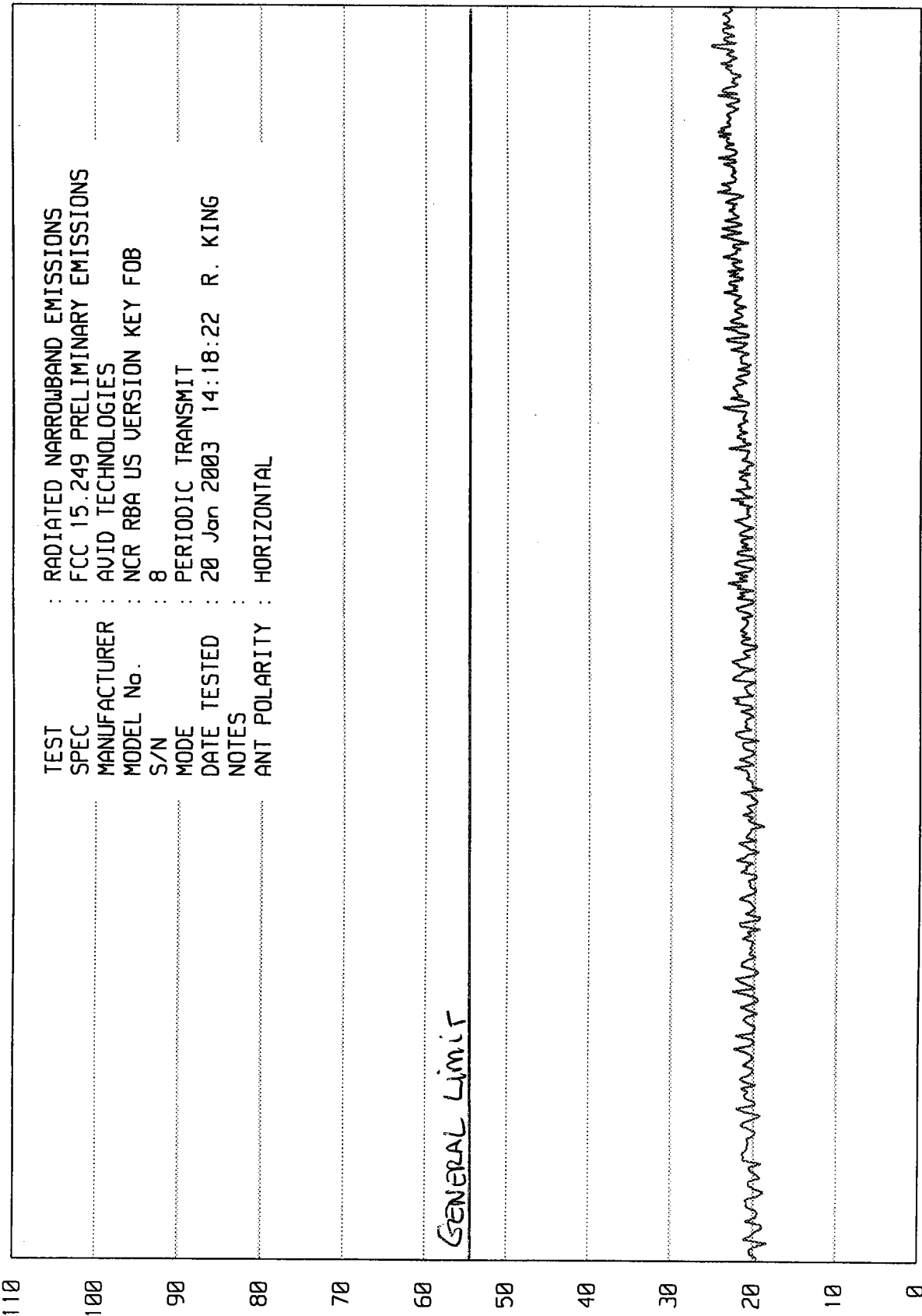
START = 30

ELITE ELECTRONIC ENGINEERING Inc.

Downers Grove, Ill. 60515

UNIU_EM RUN RUN 1

UKA0 11/15/02



TEST : RADIATED NARROWBAND EMISSIONS
 SPEC : FCC 15.249 PRELIMINARY EMISSIONS
 MANUFACTURER : AVID TECHNOLOGIES
 MODEL No. : NCR RBA US VERSION KEY FOB
 S/N : 8
 MODE : PERIODIC TRANSMIT
 DATE TESTED : 20 Jan 2003 14:18:22 R. KING
 NOTES :
 ANT POLARITY : HORIZONTAL

START = 1000

FREQUENCY - MHz

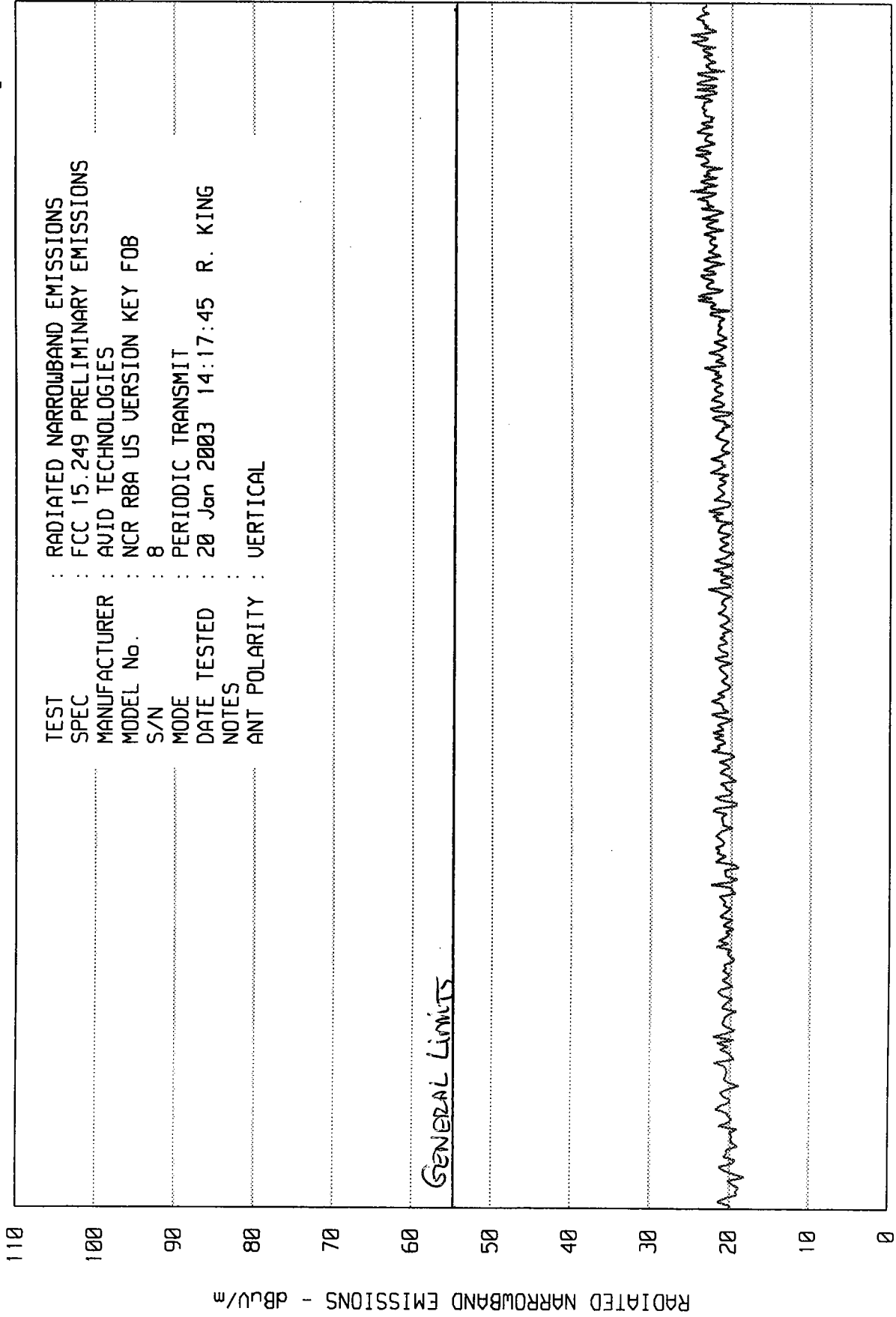
STOP = 2000

ELITE ELECTRONIC ENGINEERING Inc.

Downers Grove, Ill. 60515

WK90 11/15/02

UNITU_EM RUN RUN 1



START = 1000

FREQUENCY - MHz

STOP = 2000

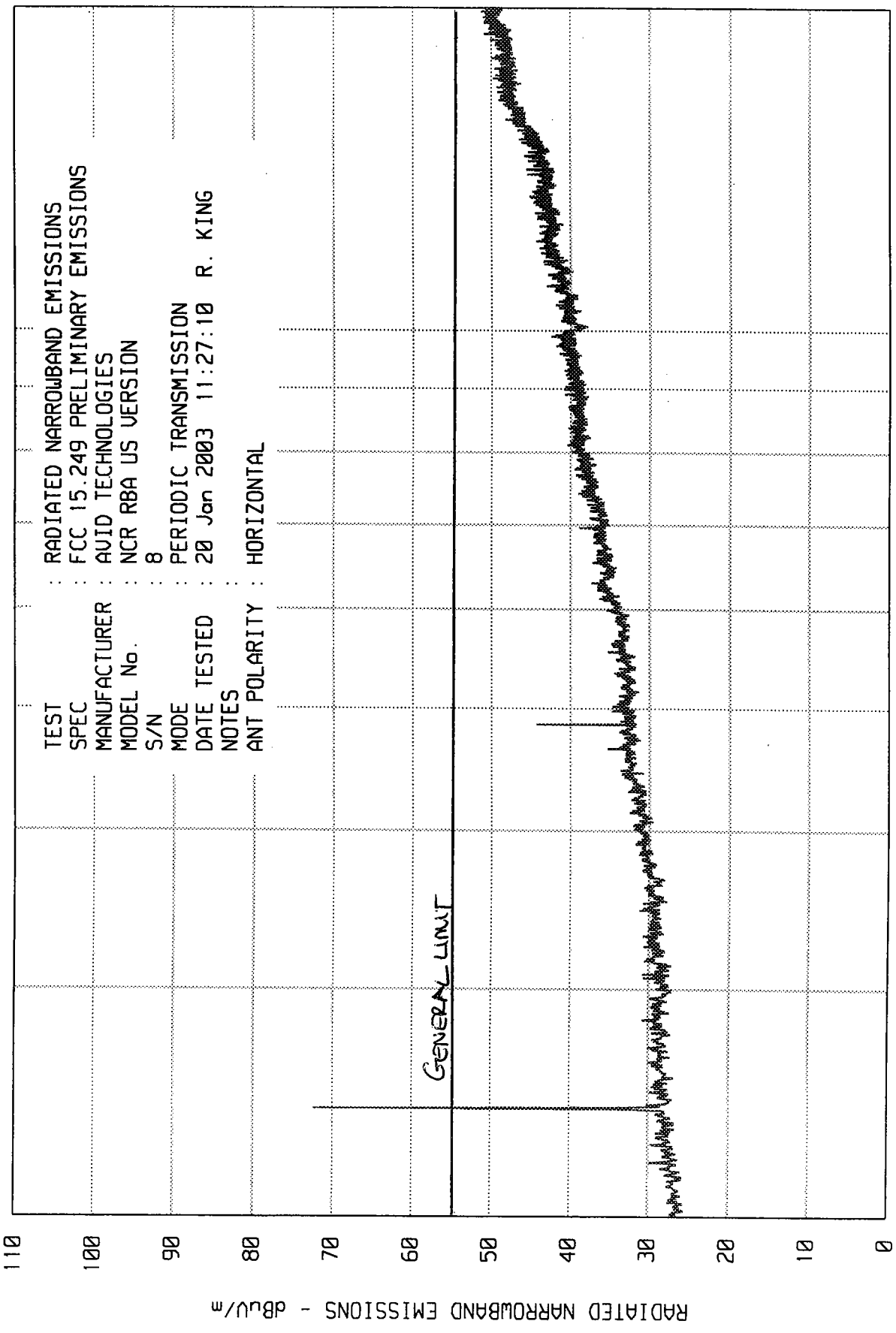
ETR 3598-01

ELITE ELECTRONIC ENGINEERING Inc.

Dawners Grove, Ill. 60515

UNIU_EM RUN RUN 1

UKA0 11/15/02



TEST : RADIATED NARROWBAND EMISSIONS
 SPEC : FCC 15.249 PRELIMINARY EMISSIONS
 MANUFACTURER : AVID TECHNOLOGIES
 MODEL No. : NCR RBA US VERSION
 S/N : 8
 MODE : PERIODIC TRANSMISSION
 DATE TESTED : 20 Jan 2003 11:27:10 R. KING
 NOTES :
 ANT POLARITY : HORIZONTAL

START = 2000

10000

FREQUENCY - MHz

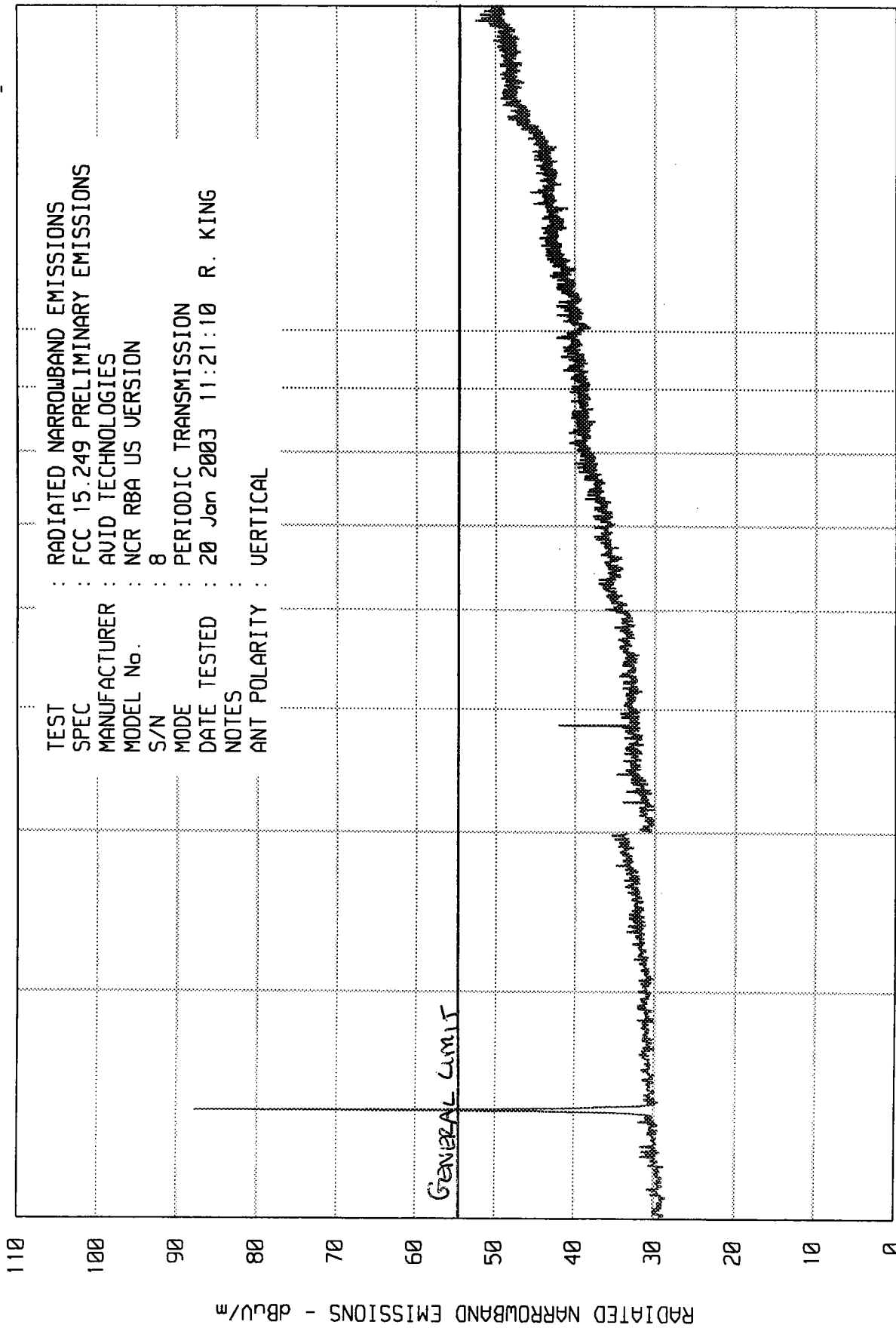
STOP = 18000

ELITE ELECTRONIC ENGINEERING Inc.

Downers Grove, Ill. 60515

UNIU_EM RUN RUN 1

WJKB 11/15/02



START = 2000

10000

FREQUENCY - MHz

STOP = 18000



ETR 31598-02
DATA SHEET

MANUFACTURER : AVID Technologies
 MODEL : NCR RBA US Version
 S/N : 8
 SPECIFICATION : FCC 15.249
 DATE : January 20, 2003
 NOTES : TEST DISTANCE IS 3 METERS

FREQ MHz	ANT POL	MTR RDG dBuV	Amb.	BW	ANT FAC	CABLE LOSS	PRE AMP	TOTAL dBuV/m	TOTAL uV/m	15.249 LIMIT uV
2428.3	H	90.7		1M/10	30.9	3.0	-34.7	89.9	31260.8	50000
	V	94.3		1M/10	30.9	3.0	-34.7	93.5	47315.1	50000
4856.6	H	47.6		1M/10	35.2	4.0	-34.7	52.1	400.9	500.0
	V	48.1		1M/10	35.2	4.0	-34.7	52.6	424.6	500.0
7284.9	H	32.3	Amb.	1M/10	38.2	6.2	-34.9	41.8	122.5	500.0
	V	33.5	Amb.	1M/10	38.2	6.2	-34.9	43.0	140.6	500.0
9713.2	H	32.1	Amb.	1M/10	39.9	7.0	-35.1	43.9	156.7	500.0
	V	32.0	Amb.	1M/10	39.9	7.0	-35.1	43.8	154.9	500.0
12141.5	H	32.9	Amb.	1M/10	41.5	7.9	-33.9	48.4	263.6	500.0
	V	32.8	Amb.	1M/10	41.5	7.9	-33.9	48.3	260.6	500.0
14569.8	H	36.1	Amb.	1M/10	42.6	1.1	-33.4	53.2	209.9	500.0
	V	36.2	Amb.	1M/10	42.6	1.1	-33.4	53.3	211.3	500.0
16998.1	H	36.6	Amb.	1M/10	44.5	1.3	-33.5	56.8	278.6	500.0
	V	36.5	Amb.	1M/10	44.5	1.3	-33.5	56.7	275.4	500.0
19426.4	H	12.3	Amb.	1M/10	40.4	0.0	0.0	52.7	431.5	500.0
	V	11.0	Amb.	1M/10	40.4	0.0	0.0	51.4	371.5	500.0
21854.7	H	12.2	Amb.	1M/10	40.5	0.0	0.0	52.7	431.5	500.0
	V	11.9	Amb.	1M/10	40.5	0.0	0.0	52.4	416.9	500.0
24283.0	H	12.6	Amb.	1M/10	40.6	0.0	0.0	53.2	457.1	500.0
	V	12.2	Amb.	1M/10	40.6	0.0	0.0	52.8	436.5	500.0

Note: Peak level < 20dB above average in all cases.

CHECKED BY: *Richard E. King*
Richard E. King

ELITE ELECTRONIC ENGINEERING Inc.

MKR ^-26.34 MHz
-46.10 dB

hp

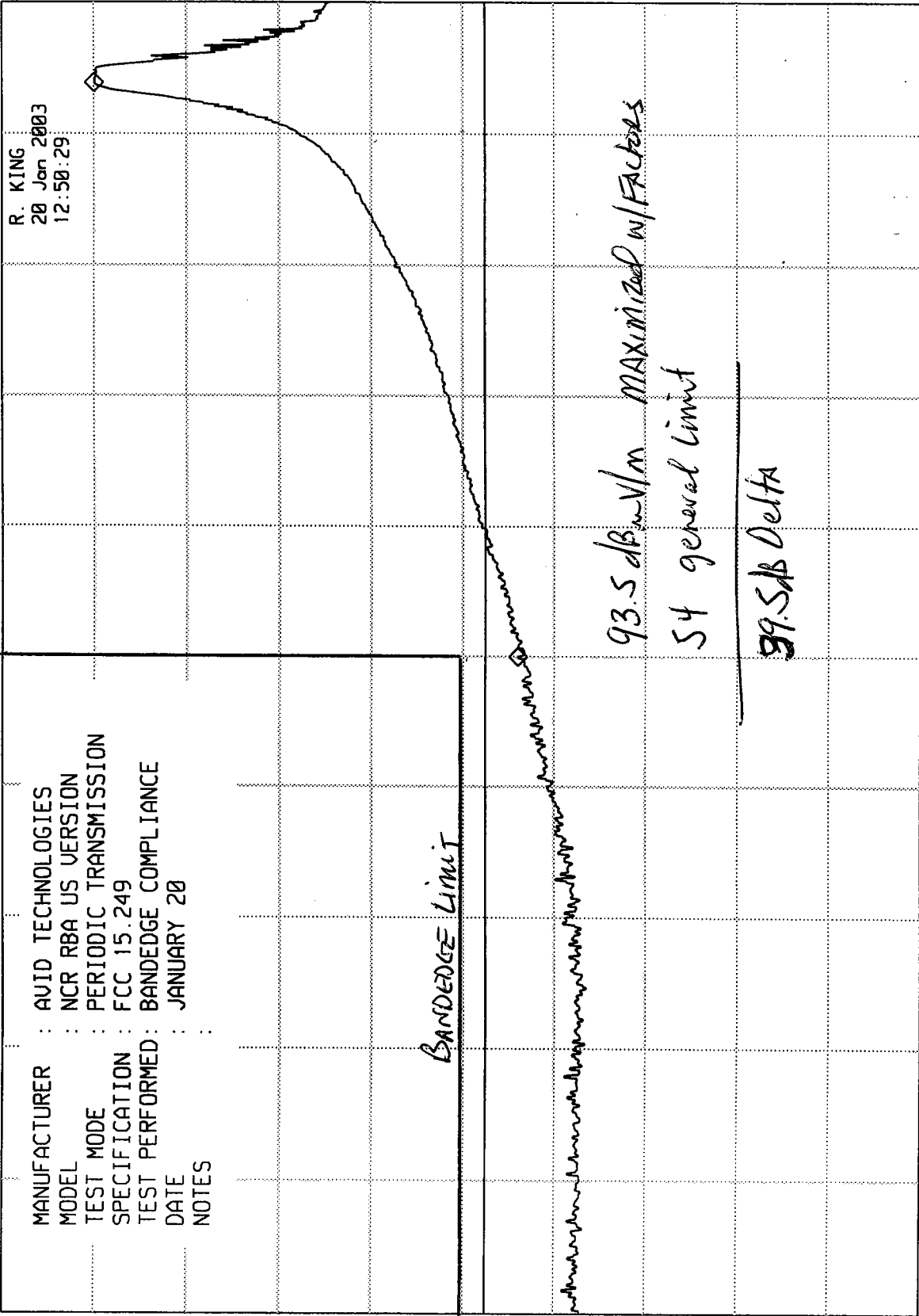
REF 107.0 dBuV

ATTEN 10 dB

10 dB/

OFFSET
-20.0
dB

DL 54.5
dBuV



CENTER 2.402 0 GHz

RES BW 1 MHz(i)

UBW 3 MHz

SPAN 60.0 MHz

SWP 20.0 msec

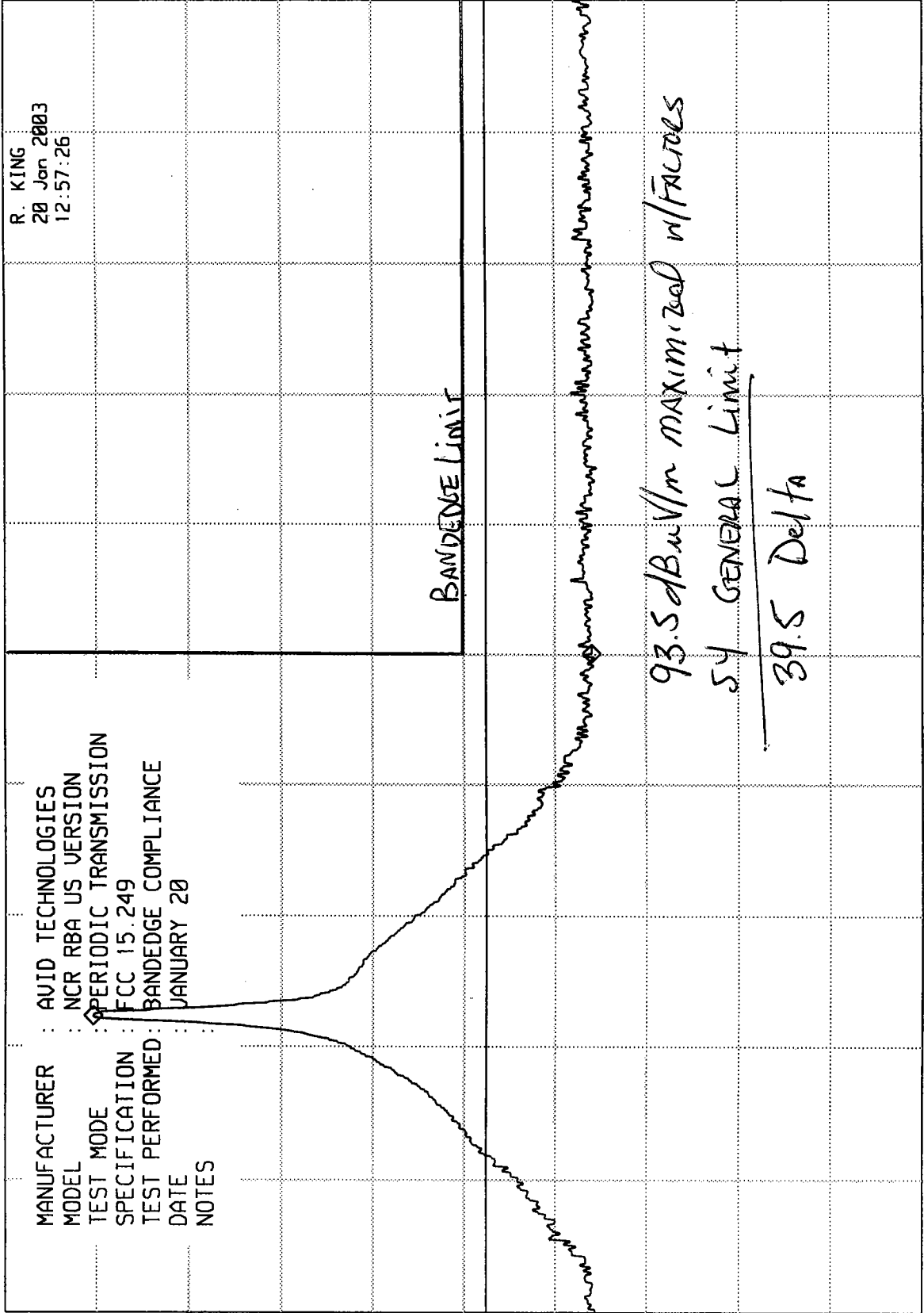
ELITE ELECTRONIC ENGINEERING Inc.

MKR ^-55.6 MHz
54.50 dB

hp

REF 107.0 dBuV

ATTEN 10 dB



10 dB/

OFFSET
-20.0
dB

DL 54.5
dBuV

ETR 31598-01

CENTER 2.483 GHz

RES BW 1 MHz (i)

VBW 3 MHz

SPAN 200 MHz
SWP 20.0 msec